



Asia-Pacific Marine Finfish Aquaculture Network

Magazine



Collaborating organizations



Sustainable, profitable and socially responsible - building a 'triple bottom line' grouper and snapper culture industry in Komodo

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With over 17,500 islands, and an estimated 80,000 km of coastline, Indonesia has long been recognized as having enormous potential for marine fish cage culture. However, a shortage of marine hatchery capacity as well as a lack in capacity to address technical challenges and to develop sustainable fish culture businesses have meant that

existing cage culture of marine fish has fallen far short of its potential.

The Nature Conservancy, a US-based conservation organisation, has developed a model for regional marine fish cage culture industries in Indonesia. A pilot hatchery and grow-out project, based just north of Komodo Island, eastern Indonesia, has



Aerial view of Loh Bongi.

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Above: The hatchery. Below: Shots of the grow out facility.



now been operational since January 2003, and has demonstrated the technical feasibility of the model with the first harvest of 500kg of estuary grouper *Epinephelus coioides* in June 2004. The pilot project is scaled to produce 25 tonnes of live grouper and snapper annually, but the successful development of the project into a viable operation will require its up-scaling to a production capacity of

around 200 tonnes. Consequently, The Nature Conservancy is now looking for partners to assist in the transformation of this pilot project into a triple bottom line business – namely profitable, sustainable and socially responsible.

The cage culture operations will supply live grouper and snapper to the Hong Kong-based live reef fish trade. Market prices for live fish are high – typically between US\$5 to US\$30 per kg depending on the species – and an existing network of mobile fish buyers ensures that the live product can be sold at the farm gate, with no need for investment in processing, packing or export. In fact, the fish farm model described here was developed as part of a wider goal to contribute to the transformation the entire live reef fish trade to a sustainable practice.

The hatchery

The pilot project described here aims to demonstrate the viability of a fish culture industry of this type in remote parts of Indonesia and other parts of Southeast Asia.

The species of fish selected for culture were chosen taking into account the market price, ease of culture and local availability of broodstock. At Komodo, five species of fish are currently maintained as broodstock – estuary grouper *Epinephelus coioides*, tiger grouper *E. fuscoguttatus*, humpback or mouse grouper *Cromileptes altivelis*, mangrove jack *Lutjanus*



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argenteimaculatus and seabass *Lates calcarifer*. All were caught as juveniles or adults over the last five years in local waters, and thus are not threat to the genetic integrity of the local stocks, and avoiding the need of importing broodstock and eggs, with its attendant risk of disease introduction. In addition, a stock of leopard coral grouper *Plectropomus leopardus* have recently been included in the broodstock facility.

The broodstock are maintained in cages throughout the whole egg-production cycle. Techniques have been developed to allow egg collection, and excellent broodstock condition and minimal stress result in all fish species maintained (with the exception of seabass) spawning naturally, without the need for hormonal manipulation. This helps ensure good egg quality and high hatching rates.

The hatchery itself consists of a shore-based flow-through system. Water is drawn from the sea through sand filters, then directly to the hatchery and live feed production facilities. Water quality is excellent, with a temperature range of 26-31°C, and salinity of 34 ppt. After passing through the hatchery, the water passes through a system of simple settlement ponds that act as a trap for particulate material and as a natural biological filter, before being returned to the sea.

Phytoplankton and rotifers (both small and super-small strains) are produced by way of batch cultures, using open mass-production techniques. Such systems result in modest productivity levels, but, most importantly, are simple and workable – necessary requirements if such hatcheries are easily replicated in other remote parts of Southeast Asia. Pure master cultures of algae and rotifers are available from research institutes in Indonesia, and imported products such as enrichment diets, Artemia cysts and high quality larval feeds are readily available from local agents.

Live feed production facilities, and the fish larval rearing and nursery units, are constructed from locally available materials, using local contractors, wherever possible. Small culture volumes are maintained in fiberglass tanks, whilst larger mass production volumes use concrete tanks.

Fish larvae are reared in 10 cubic metre tanks, and maintained on a diet of enriched rotifers, Artemia and high quality larval diets until weaning at 40 – 50 days of age, after which fish are graded and transferred to the nursery section of the hatchery, where fish are grown-on to a size suitable for transfer to cages. Larval rearing protocols are based on those developed at Gondol Research Institute for Mariculture, Bali and are thus proven, workable techniques, with typical larval survival rates of successful batches varying between 1 and 10%. The hatchery itself has been built in a modular form, allowing the replication and scale up of the existing facility with a minimum of disruption and at a minimum cost.

Grow-out farms and community involvement

A key part of this fish culture model is to use local communities in the cage grow-out of the grouper and snapper produced by the hatchery. Such communities are often well placed to do this, typically being located in suitable coastal locations for cage culture as well as having prior experience of holding live fish in cages, or at least in fishing. Consequently, this model has a further function in providing alternative livelihoods to communities previously reliant upon destructive reef fishing practices, and thus reducing the fishing pressure on vulnerable stocks of reef fish and the associated damage to coral reef communities.

Two community grow-out units had been established by July 2004, with the first harvest of grouper carried out during June 2004. Cages and related infrastructure are made from low cost, locally available materials such as wood and plastic drums, and are, therefore, restricted to sheltered locations, in close proximity to the local community involved in their operation. Each grow-out unit is scaled to rear up to six tonnes of grouper and snapper per annum.

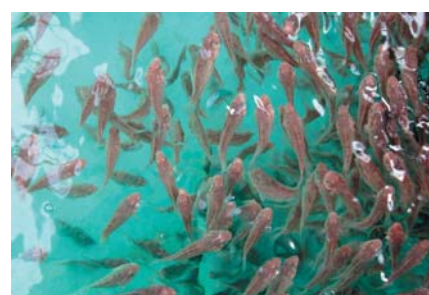
Future development

The Komodo Fish Culture pilot project has successfully overcome a number of major technical challenges, and has shown that an operation of this type is technically feasible. The project is now

ready, therefore, to enter its most critical and exciting phase: Transformation into a triple bottom line business that is not only profitable but that also benefits local people and is environmentally sound. As a global non-governmental, non-profit organization, The Nature Conservancy fully realizes that this transformation must be driven by the private sector, with the Conservancy only in a supporting and catalytic role. The approach to this process is that the Conservancy will carry out a final feasibility study, which will support the formation of a business group that will take over and up-scale the fish culture facilities and that will operate as an independent business. Fish culture companies who are interested in becoming involved in business development are invited to contact Trevor Meyer (tmeyer@tnc.org) or Peter Mous (pmous@tnc.org).



Mouse grouper *Cromileptes altivelis*.



Juvenile tiger grouper, *Epinephelus fuscoguttatus*.



Changing the nets.